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**AQUATIC INVERTEBRATES AND HABITAT AT A FIXED
STATION ON THE POWDER RIVER,
CUSTER COUNTY, MONTANA**

July 26, 2001

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A report to
the Montana Department of Environmental Quality
Helena, Montana

by
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May 2002

INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the Powder River near the community of Locate in Custer County, Montana on July 26, 2001. The sample site was located by GPS reading at 46° 25' 31" N, 105° 18' 23" W, lying within the Northwestern Great Plains Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of either a composite of four Hess samples, or a one-minute kicknet collection (Bukantis 1998). Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrates was accomplished by applying the method recommended by Bukantis (1998) for streams of Montana's Plains Ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity. Results from the application of other metric batteries may be found in the Appendix.

RESULTS AND DISCUSSION

Table 1 itemizes the nine evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Table 1. Stream and riparian habitat assessment for a fixed station on the Powder River, near Locate, Montana. July 2001.

| Max. possible score | Parameter | Powder River at Locate |
|---------------------|-------------------------------|------------------------|
| 10 | Riffle development | 9 |
| 10 | Benthic substrate | 5 |
| 20 | Embeddedness | 2 |
| 20 | Channel alteration | 15 |
| 20 | Sediment deposition | 1 |
| 20 | Channel flow status | 18 |
| 20 | Bank stability: left / right | 5 / 5 |
| 20 | Bank vegetation: left / right | 9 / 9 |
| 20 | Vegetated zone: left / right | 9 / 9 |
| 160 | Total | 96 |
| | Percent of maximum CONDITION* | 60 SUB-OPTIMAL |

*Condition categories: Optimal > 80% of maximum score; Sub-optimal 75 - 56%; Marginal 49 - 29%; Poor <23%. Adapted from Plafkin et al. 1998.

Although overall habitat conditions scored sub-optimally, scores for individual parameters suggest that instream factors potentially limit available niches for invertebrates. Benthic substrate was rated marginal, suggesting monotonous particle sizes. Silt and sand are implicated, since sediment deposition as well as embeddedness was judged severe. These conditions may have been related to the marginal stability of

streambanks reported in the assessment. Notes indicate that erosion on outside banks appeared to be natural. Riparian conditions were judged optimal.

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on the Powder River is moderately impaired and only partially supports designated uses. However, very low abundance of organisms in the sample (only 13 animals were collected) complicates the evaluation; conclusions and interpretation of results are tenuous. Whether the inadequacy of the sample was due to a depauperate community at the site or to sampling bias is not clear from the data itself; however, the habitat assessment suggests that the nature of the benthic substrate may limit benthic assemblages.

Table 2. Metric values, scores, and bioassessment for a fixed station on the Powder River. The Montana DEQ bioassessment metric battery recommended for streams of Montana's Plains ecoregions (Bukantis 1998) was used for the evaluation. July 2001. Extremely low abundance of organisms renders the score, classification, and use support designation unreliable.

| Powder River at Locate | | |
|------------------------------|---------------|---------------|
| METRICS | METRIC VALUES | METRIC SCORES |
| Taxa richness | 5 | 0 |
| EPT richness | 4 | 1 |
| Biotic index | 4.92 | 3 |
| % Dominant taxon | 46.15 | 1 |
| % Collectors | 100 | 0 |
| % EPT | 53.85 | 3 |
| Shannon diversity | 1.99 | 1 |
| % Scrappers and Shredders | 0 | 0 |
| Predator taxa | 0 | 0 |
| % Multivoltine | 15.38 | 3 |
| TOTAL SCORE (max.=30) | | 12 |
| PERCENT OF MAX. | | 40 |
| Impairment classification | | MODERATE |
| USE SUPPORT | | PARTIAL |

Functionally, the vast majority (85%) of animals collected in the sample were filter-feeders, these included 2 taxa of hydropsychid caddisflies and the blackfly *Simulium* sp. If the sample is representative of benthic assemblages characteristic of this site, the abundance of this group would suggest that fine particles in suspension were plentiful and included ample organic components. Filter-feeders are expected to be abundant in high-order streams. Turbid conditions were noted by field personnel, and recent rains had apparently influenced flow, possibly contributing to the low abundance of animals captured in the sample. Three of the 5 collected taxa (*Fallceon quilleri*, *Tricorythodes minutus*, and *Cheumatopsyche* sp.) prefer warm water temperatures; field notes indicate that water temperature was measured at 24° C.

CONCLUSION

- Low abundance of organisms in the sample prohibits assessment of the site based on invertebrate assemblages. Filter-feeders represented 85% of the animals collected, and 3 of the 5 taxa present were warm stenotherms.

LITERATURE CITED

- Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft. April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.
- Woods, A.J., Omernik, J.M., Nesser, J.A., Shelden, J., and Azevedo, S.H. 1999. Ecoregions of Montana (Color poster with map, descriptive text, summary tables, and photographs). Reston, Virginia. US Geological Survey.

APPENDIX
Taxonomic data and summaries
Powder River at Locate
July 2001

Aquatic Invertebrate Taxonomic Data

Site Name: Powder River near Locate

Site ID: Y21POWDR01 7/26/01

| Taxon | Approx. percent of sample used 100 | | | |
|------------------------------|------------------------------------|---------------|-----|-----|
| | Quantity | Percent | HBI | FFG |
| <i>Fallceon quilleri</i> | 1 | 7.69 | 5 | CG |
| <i>Tricorythodes minutus</i> | 1 | 7.69 | 4 | CG |
| Total Ephemeroptera | 2 | 15.38 | | |
| <i>Cheumatopsyche</i> sp. | 3 | 23.08 | 5 | CF |
| <i>Hydropsyche</i> sp | 2 | 15.38 | 5 | CF |
| Total Trichoptera | 5 | 38.46 | | |
| <i>Simulium</i> sp | 6 | 46.15 | 5 | CF |
| Total Diptera | 6 | 46.15 | | |
| Grand Total | 13 | 100.00 | | |

Aquatic Invertebrate Summary

Site Name: Powder River near Locate

Date: 7/26/01

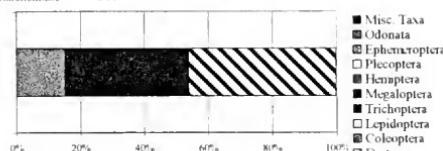
SAMPLE TOTAL:

13

| | |
|-----------------|-------|
| EPT abundance | 7 |
| TAXA RICHNESS | 5 |
| Number EPT taxa | 4 |
| Percent EPT | 53.85 |

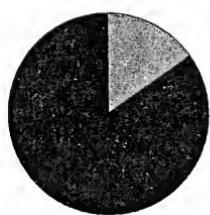
TAXONOMIC COMPOSITION

| GROUP | PERCENT | # TAXA | ABUNDANCE |
|---------------|---------|--------|-----------|
| Misc. Taxa | 0.00 | 0 | 0 |
| Odonata | 0.00 | 0 | 0 |
| Ephemeroptera | 15.38 | 2 | 2 |
| Plecoptera | 0.00 | 0 | 0 |
| Hemiptera | 0.00 | 0 | 0 |
| Megaloptera | 0.00 | 0 | 0 |
| Trichoptera | 38.46 | 2 | 5 |
| Lepidoptera | 0.00 | 0 | 0 |
| Coleoptera | 0.00 | 0 | 0 |
| Diptera | 46.15 | 1 | 6 |
| Chironomidae | 0.00 | 0 | 0 |



FUNCTIONAL COMPOSITION

| GROUP | PERCENT | # TAXA | ABUNDANCE |
|-----------|---------|--------|-----------|
| Predator | 0.00 | 0 | 0 |
| Parasite | 0.00 | 0 | 0 |
| Gatherer | 15.38 | 2 | 2 |
| Filterer | 84.62 | 3 | 11 |
| Herbivore | 0.00 | 0 | 0 |
| Piercer | 0.00 | 0 | 0 |
| Scraper | 0.00 | 0 | 0 |
| Shredder | 0.00 | 0 | 0 |
| Xylophage | 0.00 | 0 | 0 |
| Omnivore | 0.00 | 0 | 0 |
| Unknown | 0.00 | 0 | 0 |



- Misc. Taxa
- Odonata
- Ephemeroptera
- Plecoptera
- Hemiptera
- Megaloptera
- Trichoptera
- Lepidoptera
- Coleoptera
- Diptera
- Chironomidae

Site ID: Y21POWDR01

| DOMINANCE | | ABUNDANCE | PERCENT |
|-----------------------|----|-----------|---------|
| Simulium sp. | 6 | 46.15 | |
| Chemnopsyches sp. | 3 | 23.08 | |
| Hydropsyche sp. | 2 | 15.38 | |
| Fallacron guilleri | 1 | 7.69 | |
| Tricorythodes minutus | 1 | 7.69 | |
| SUBTOTAL 5 DOMINANTS | 13 | 100.00 | |

TOTAL DOMINANTS 13 100.00

SAPROBITY Hilsenhoff Biotic Index 4.92

DIVERSITY Shannon H (loge) 1.38
Shannon H (log2) 1.90

Simpson D #DIV/0!

VOLTINISM TYPE ABUNDANCE PERCENT

| TYPE | ABUNDANCE | PERCENT |
|--------------|-----------|---------|
| Multivoltine | 2 | 15.38 |
| Univoltine | 11 | 84.62 |
| Semivoltine | 0 | 0.00 |

TAXA CHARACTERS

| # TAXA | ABUNDANCE | PERCENT |
|------------|-----------|---------|
| Tolerant | 2 | 30.77 |
| Intolerant | 0 | 0.00 |
| Clinger | 3 | 84.62 |

BIOASSESSMENT INDICES

| B-IBI (karr et al.) | SCORE |
|---------------------|-------|
| Taxa richness | 5 |
| E richness | 2 |
| P richness | 0 |
| T richness | 2 |
| Long-lived | 0 |
| Sensitive richness | 0 |
| %tolerant | 30.77 |
| %predators | 0.00 |
| Clinger richness | 3 |
| %dominance (3) | 84.62 |
| TOTAL SCORE | 12 |

24 %

MONTANA DEQ METRICS (Bukantis 1998)

| METRIC | VALUE | Values and Formula | Maximum |
|-----------------------|----------|--------------------|---------|
| Taxa richness | 5 | 0 | 0 |
| EPT richness | 4 | 1 | 0 |
| Biotic Index | 4.92 | 3 | 2 |
| %Dominant taxon | 46.15 | 1 | 1 |
| %Collectors | 100.00 | 0 | 0 |
| %EPT | 53.85 | 3 | 2 |
| Shannon Diversity | 1.90 | 1 | |
| %Scrapers + Shredders | 0.00 | 0 | 0 |
| Predator taxa | 0 | 0 | |
| %Multivoltine | 15.38 | 3 | |
| %H of T | 100 | 0 | |
| TOTAL SCORES | 12 | 5 | 2 |
| PERCENT OF MAXIMUM | 40.00 | 20.83 | 9.52 |
| IMPAIRMENT CLASS | Moderate | Moderate | Severe |

Montana DEQ metric batteries



COMMUNITY TOLERANCES

| | |
|----------------------------------|------|
| Sediment tolerant taxa | 1 |
| Percent sediment tolerant | 7.69 |
| Sediment sensitive taxa | 0 |
| Percent sediment sensitive | 0.00 |
| Metals tolerance index (McGuire) | 4.92 |
| Cold stenotherm taxa | 0 |
| Percent cold stenotherms | 0.00 |

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